

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

HERA WIRELESS S.A.,
Patent Owner.

IPR2018-01700
Patent 7,369,878 B2

Before THOMAS L. GIANNETTI, ROBERT L. KINDER, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

GIANNETTI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Intel Corporation (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–4 (the “challenged claims”) of U.S. Patent No. 7,369,878 B2 (Ex. 1001, the “’878 patent”). Paper 2 (“Pet.”). Patent Owner (Hera Wireless S.A.) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). After considering the arguments presented in Patent Owner’s Preliminary Response, we determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim. Pursuant to 35 U.S.C. § 314, we instituted this *inter partes* review as to all of the challenged claims and all grounds raised in the Petition. Paper 9 (“Institution Dec.”).

Following institution, Patent Owner filed a Response. Paper 17 (“PO Resp.”). Subsequently, Petitioner filed a Reply (Paper 18, “Pet. Reply”) and Patent Owner filed a Sur-reply (Paper 20).

We held an oral hearing on January 22, 2020, and a transcript of the hearing is included in the record. Paper 28 (“Hearing Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a). For the reasons we identify below, we determine that Petitioner had demonstrated by a preponderance of the evidence that claims 1–4 are unpatentable.

B. Related Proceedings

The following matters are related to the ’878 patent:

1. The parties identify numerous district court proceedings concerning the ’878 patent. Pet. 2; Papers 3, 5, 6.

2. The '878 patent was also the subject of a petition for *inter partes* review filed in IPR2018-01738 by Ruckus Wireless, Inc. Paper 6, 3. The Board denied the petition and declined to institute a trial in that proceeding. IPR2018-01738, Paper 21.

3. Ruckus Wireless, Inc. and Petitioner have filed other petitions challenging related patents. Paper 6, 3–4.

C. The '878 Patent

The '878 patent is titled “Radio Base Station Apparatus, Radio Terminal Apparatus, Mobile Communication System, and Reception Operation Control Program.” Ex. 1001, (54).

The '878 patent explains that prior art mobile communication systems, such as the Personal Handyphone System (PHS), use Path Division Multiple Access (PDMA) schemes to allow radio terminals of a plurality of users to be connected to a radio base station in a spatial multiplexing manner, by spatially dividing an identical time slot of an identical frequency. *Id.* at 1:36–44. In a PDMA scheme, a receiving terminal may use either selective diversity reception (“diversity reception”) using a plurality of antennas, or adaptive array reception, where a received signal is extracted with reception directivity through an adaptive array process. *Id.* at 1:45–51, 1:64–66.

When a terminal device using diversity reception receives a transmission from a base station that uses an adaptive array transmission technique, the terminal may receive signals not intended for it, thereby reducing its DU ratio (ratio of desired signal power to undesired signal power). *Id.* at 4:6–14. The '878 patent aims to overcome this problem by causing the terminal to perform a reception operation that is adapted to the

transmission operation of the base station. *Id.* at 4:25–38. Specifically, an indicating signal instructs the terminal to receive the frame in the manner prescribed to it by the base station. *Id.* at 15:36–61. When the terminal receives this signal, it adapts its reception operation to the transmission operation of the base station and proceeds to receive a frame in an optimal manner. *Id.* at 16:14–20.

For example, in one embodiment described in the patent, a terminal is configured to receive a signal from an adaptive array base station. *Id.* at 15:36–40. The signal tells the terminal to stop diversity operation in which its reception antennas are switched in accordance with a reception level. *Id.* at 15:40–42. The terminal thus controls the antenna selection such that one of the plurality of antennas used in diversity operation (the antenna that was used for transmitting an uplink signal to the base station) is used for receiving a downlink signal from the base station in the immediately following frame. *Id.* at 15:42–47.

This is illustrated by Figure 1 of the '878 patent, reproduced below:

F I G. 1

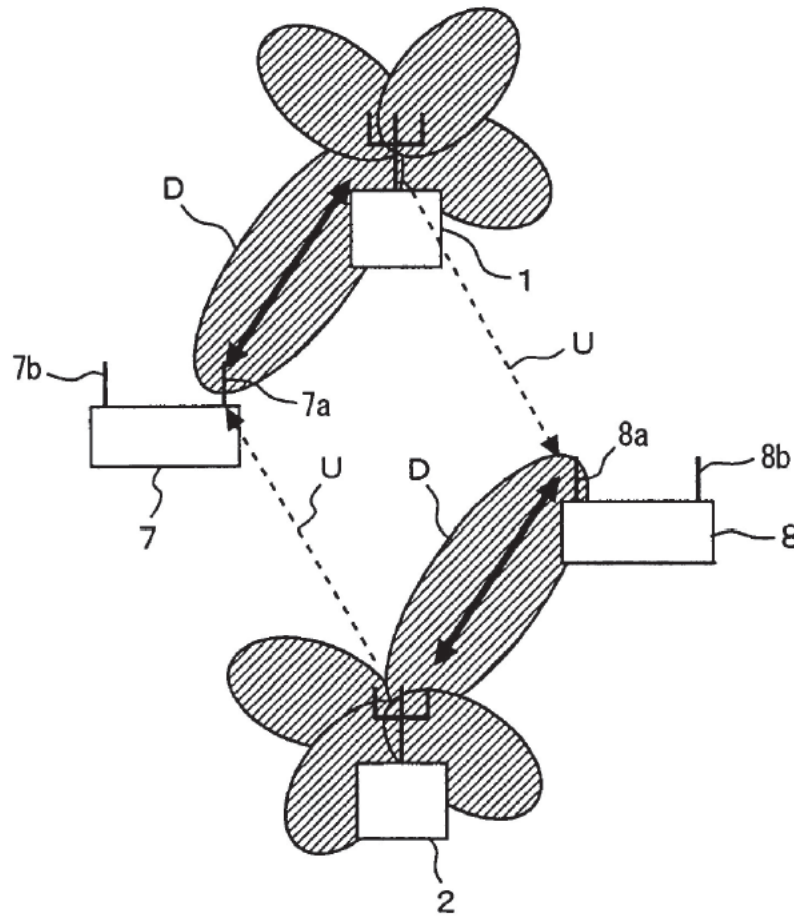


Figure 1 is a conceptual view showing the operation principle of an embodiment described in the '878 patent. Ex. 1001, 15:13–15. Adaptive array base stations 1 and 2 each transmit a signal to the terminal 7 or 8 requesting connection. *Id.* at 15:18–20. The signal indicates a reception operation of the terminal that is adapted to the transmission operation of the adaptive array base station performing the downlink transmission directivity control. *Id.* at 15:20–23. In this embodiment, terminals 7 and 8 normally perform diversity reception, and when receiving the above-described signal indicating the reception operation of the terminal from the base station, they stop performing selective diversity reception that is based on a reception

level of the signal and transit to, for example, a reception operation as described below. *Id.* at 15:24–30.

In this embodiment, when terminal 7 receives a signal from base 1 with which connection is desired, the terminal shifts from diversity reception using antennas 7a and 7b to use of one antenna 7a. *Id.* at 15:49–54. As a result, the beam of signal wave D from base station 1 is directed to antenna 7a, as indicated in Figure 1 by a bold arrow. *Id.* at 15:57–60. This shift to a single antenna minimizes the effect of interference wave U from non-desired base station 2. *Id.* at 15:60–61.

Figure 10 of the 878 patent is reproduced below.

FIG. 10

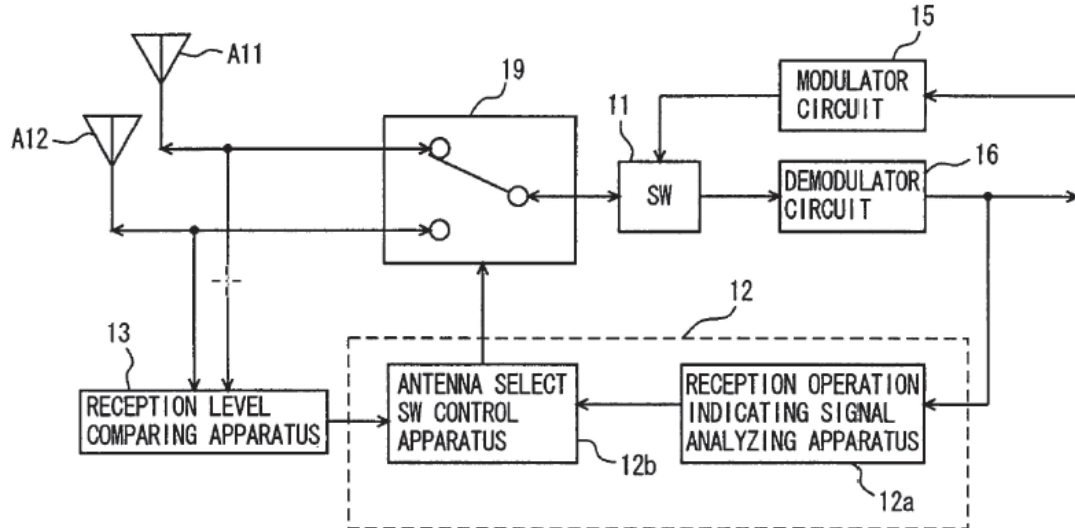


Figure 10 of the '878 patent is a functional block diagram of a terminal embodiment. Ex. 1001, 14:27–28. Figure 10 is an illustration of a terminal that can perform diversity reception as well as single-antenna reception after

receiving a signal indicating adaptive array processing is unavailable. *Id.* at Fig. 15, 21:60–22:3.

D. Illustrative Claims

The '878 patent has four claims. All were challenged in the Petition. Claims 1 and 3 are the independent claims. Claim 1 recites:¹

1. A radio base station apparatus for transmitting a frame to a radio terminal apparatus, the radio base station apparatus comprising:

[a] a receiver for receiving a connection request from the radio terminal apparatus; and

[b] a transmitter for transmitting the frame to the radio terminal apparatus which has sent the connection request, the frame including (1) a signal indicating a reception operation adapted to a transmission operation of the radio base station apparatus and (2) data,

[c] wherein the signal is a [bit] having first and second bit values which specify first and second reception operations, respectively, one of the first and second bit values instructing the radio terminal apparatus to accept the frame only in a prescribed manner determined by the one bit value and adapted to a corresponding transmission operation of the radio base station apparatus.

Claim 3 recites:

3. A communication method comprising:

[a] receiving a connection request from a radio terminal apparatus; and

[b] transmitting a frame to the radio terminal apparatus which has sent the connection request, the frame including (1) a signal indicating a reception operation adapted to a transmission operation of the radio base station apparatus and (2) data,

¹ Patent Owner provided the alterations in both claims 1 and 3, including the letters in brackets identifying the paragraphs and the addition of the word “bit”. PO Resp. 10–11.

[c] wherein the signal is a [bit] having first and second bit values of which specify first and second reception operations, respectively, one of the first and second bit values instructing the radio terminal apparatus to accept the frame only in a prescribed manner determined by the one bit value and adapted to a corresponding transmission operation of the radio base station apparatus.

Claim 2 depends from claim 1. Claim 4 depends from claim 3. The dependent claims are similar, in that both add a limitation requiring a plurality of antennas to the base and transmitter.

E. References and Other Evidence

The Petition relies on the following references:

1. International Pub. No. WO 99/59263 (Ex. 1003, “Park”).
2. U.S. Patent No. 7,158,493 B1 (Ex. 1004, “Uhlik”).
3. U.S. Patent App. Pub. No. 2001/0014588 A1 (Ex. 1005, “Ishida”).
4. Personal Handy Phone System Version 2 (Ex. 1007, “PHSv2”).

In addition, both Petitioner and Patent Owner rely on expert testimony. With the Petition, Petitioner submitted a Declaration of Dr. Stephen B. Wicker (Ex. 1002, “Wicker I Decl.”). Petitioner submitted a second Wicker declaration (Ex. 1022, “Wicker II Decl.”) with its Reply. Patent Owner submitted a Declaration of Dr. Jacob Sharony with the Preliminary Response (Ex. 2001, “Sharony I Decl.”). During the trial, Patent Owner submitted two additional declarations of Dr. Sharony (Ex. 2004 “Sharony II Decl.”; Ex. 2005 “Sharony III Decl.”).

F. Grounds of Unpatentability

Petitioner asserts the challenged claims are unpatentable on the following grounds:

Claims Challenged	Statutory Basis ²	Reference(s)
1–4	§§ 102, 103	Park
1–4	§ 102	Ishida
1–4	§§ 102, 103	Uhlik
1–4	§ 103	PHSv2 and Uhlik

Pet. 4, 29, 42, 56, 66.

II. PRELIMINARY MATTERS

A. *Real Parties-in-Interest*

The Petition initially named Intel Corporation as the only real party-in-interest. Pet. 1. In Updated Mandatory Notices, Petitioner “clarifies” the content of its original notices. Paper 6, 1. “Out of an abundance of caution,” Intel identifies its customers Lenovo Holdings Co., Inc. and LG Electronics USA, Inc. as additional real parties-in-interest. *Id.* at 2. Patent Owner does not contest this addition. Patent Owner names Hera Wireless S.A. and Sisvel UK Limited as real parties-in-interest. Paper 5.

B. *Level of Ordinary Skill*

Petitioner contends that “[a]s of 2001, a person of ordinary skill in the ’878 patent’s field (‘skilled person’) would have a Master’s degree in Electrical Engineering and at least 2-4 years of industry or research experience in the area of wireless communication systems.” Pet. 13 (citing Wicker I Decl. ¶ 54).

² Because the application from which the ’878 patent issued was filed before March 16, 2013, the pre-AIA (“America Invents Act”) versions of §§ 102 and 103 applies. Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011).

Patent Owner’s formulation is similar, but not identical:

The level of ordinary skill in the art applicable to the ’878 patent as of around 2001 is a person with a working knowledge of advanced antenna techniques. The person would have gained this knowledge through an undergraduate Bachelor of Science degree in Electrical Engineering or an equivalent degree, and three to five years of experience working in the field of wireless communications. Additional education or experience may serve as a substitute for these requirements.

Prelim. Resp. 10–11 (citing Sharony I Decl. ¶ 26); PO Resp. 7 (citing Sharony II Decl. ¶ 28). The two formulations differ mainly in the level of education and amount of experience in wireless communication, i.e., for a Master’s degree-level engineer, two to four years (Petitioner) or, for a Bachelor’s degree-level engineer, three to five years (Patent Owner). Also, Patent Owner’s definition is more specific in requiring “a working knowledge of advanced antenna techniques.”

We regard any differences in the formulations as immaterial. From our review of the record as a whole, including the prior art references cited, we conclude that under either formulation, a person of ordinary skill in wireless communications would have at least a “working knowledge” of advanced antenna techniques. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself may reflect an appropriate level of skill). For the purpose of our decision, we adopt Petitioner’s proposal as consistent with the prior art cited and the testimony of the parties’ experts. However, our analysis would not change and we would reach the same result with regard to this decision under either formulation.

C. Claim Construction

In this *inter partes* review, the Board interprets claim terms according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2018); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016).³ Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Additionally, any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner did not request any constructions. Pet. 13–14. Instead, Petitioner offered arguments against a potential construction of a term that it believed Patent Owner “may argue,” namely the phrase “accept the frame only in a prescribed manner,” appearing in claims 1 and 3. *Id.* at 13. Petitioner would have us construe this limitation as not limited to the frame the base station sends in response to a connection request from a terminal. *Id.* at 14.

We understood Petitioner’s proposal on claim construction to be conditioned on Patent Owner’s particular proposal for a specific term. As we did not perceive that Patent Owner had offered such a construction for

³ An amendment to this rule changing the claim construction standard does not apply here because the Petition was filed before the November 13, 2018, effective date. See Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018).

this term, we did not consider Petitioner’s conditionally proposed construction. Institution Dec. 8.

In its Preliminary Response, Patent Owner offered a construction of another term that appears both in claim 1 and claim 3. Specifically, Patent Owner requested construction of the term “reception operation adapted to a transmission operation.” Prelim. Resp. 12. Patent Owner proposed that this term be construed as “an operation of the receiving radio terminal apparatus adapted in response to an indication signal having a single bit transmitted from the radio base station apparatus.” *Id.* Patent Owner offered the following “non-limiting” examples: “adaptive array reception and transmission . . . , diversity reception operation . . . , and *performing a reception operation with a single, previously selected antenna.*” Prelim. Resp. 12 (emphasis added).

For the purpose of our Institution Decision, we did not deem it necessary to construe this term. Institution Dec. 9 (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy)). However, in IPR2018-01738, we construed that term consistently with Patent Owner’s proposal to mean “an operation of the receiving radio terminal apparatus adapted in response to an indication signal having a single bit transmitted from the radio base station apparatus,” exclusive of antenna selection and demodulation operations. IPR2018-01738, Paper 21, 8.

In the Patent Owner Response, Patent Owner does not ask us to construe “reception operation adapted to a transmission operation,” but does ask us to construe the term “wherein the signal is a [bit] having first and

second bit values which specify first and second reception operations, respectively, one of the first and second bit values instructing the radio terminal apparatus to accept the frame only in a prescribed manner determined by the one bit value.” PO Resp. 12. Patent Owner, moreover, no longer relies on “performing a reception operation with a single, previously selected antenna” as exemplary of “an operation of the receiving radio terminal apparatus adapted in response to an indication signal having a single bit transmitted from the radio base station apparatus.” *Cf.* PO Resp. 21. Patent Owner now contends that the words “first” and “second” in the phrase “first and second operations” means “two—exactly two—reception operations, one of which corresponds to one of the two recited bit values, and the other of which corresponds to the other of the two recited bit values.” *Id.* at 12 (citing Sharony II Decl. ¶ 39). Patent Owner admits the specification and prosecution history “gave no special definitions,” and thus relies on the “plain language” of the claims. *Id.* at 13.

Building on this proposed construction, Patent Owner further contends “the claimed bit must specify exactly two operations, one each for its first and second values. A negative instruction does not qualify because it is non-specific.” *Id.* Also, Patent Owner argues: “The plain language of the claims requires that one of the two claimed bit values ‘instruct[s]’ the receiver to accept a frame ‘only in a prescribed manner determined by the one bit value.’” *Id.* at 15 (alteration in original).

Petitioner responds that the constructions proposed by Patent Owner “are based on the prior art’s disclosures, not the claim language and the specification.” Pet. Reply 1. Further, Petitioner contends that the claims are

unpatentable under at least one ground, even under Patent Owner’s proposed “faulty interpretations.” *Id.* at 1, 8–14.

We agree with Petitioner that the constructions proposed by Patent Owner do not represent the broadest reasonable construction and we do not adopt them. We discuss them further *infra*, in connection with our analysis of the challenged claims.

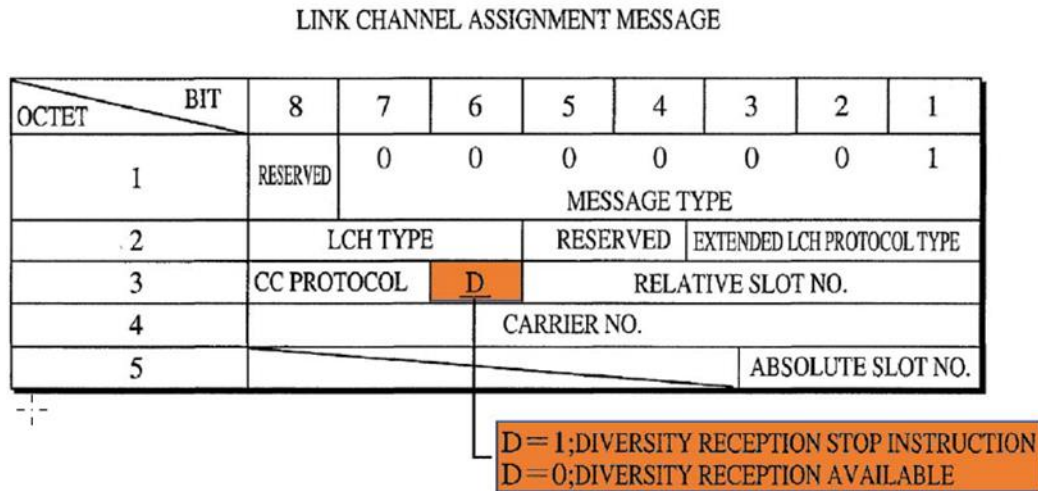
D. Description of the Prior Art References

1. Ishida (Ex. 1005)

Ishida discloses a radio base station that sends a diversity reception stop instruction to the mobile station as a response to a traffic channel assignment request. Ex. 1005, (57). In a preferred embodiment, the radio base station is a PHS base station that performs a radio communication with a PHS telephone according to a TDMA/TDD (Time Division Multiple Access/Time Division Duplex) method conforming to a PHS standard. *Id.* ¶ 36.

Figure 5 illustrates an example of a “link channel assignment message” according to that embodiment. *Id.* ¶¶ 31, 68. Petitioner provides an annotated version of that figure, which follows:

FIG.5



Pet. 18. Figure 5 shows a Link Channel Assignment Message including a D Flag field. Ex. 1005 ¶ 68. When set to “1,” the D flag indicates a diversity reception stop instruction against the mobile station; when set to “0,” the D flag indicates that diversity reception is possible. *Id.*

Ishida qualifies as prior art under 35 U.S.C. § 102(e). Pet. 17. Ishida was prior art of record during prosecution of the ’878 patent. PO Resp. 27.⁴

2. Park (Ex. 1003)

Park describes a transmission diversity control method in a “mobile communication system including a base station which transmits forward common and dedicated channel data through at least two antennas with transmission diversity.” Ex. 1003, Abstract. The base station sends a message indicating a TSTD (Time Switched Transmission Diversity) or non-

⁴ Petitioner explains that Ishida was cited in a co-pending application, and an Interview Summary from that application mentioning Ishida was submitted in the ’878 patent application. Pet. 42. The extent to which the Examiner considered Ishida is unclear from the sparse prosecution record. *Id.* at 42–43.

TSTD transmission mode “through an antenna to a plurality of mobile stations in the coverage area of the base station. Then, each mobile station analyses the message received from the base station and sets its reception mode to a TSTD/non-TSTD mode according to the transmission mode.” *Id.*

Petitioner relies on Figure 8C of Park. Figure 8C follows:

CCCH MESSAGE FORMAT			
MESSAGE TYPE	TSTD MODE CHANGE (OPTIONAL)	TSTD PATTERN (OPTIONAL)	OTHER INFORMATION ELEMENTS

FIG. 8C

Figure 8C is an example of a message format used by Park.

Park qualifies as prior art under 35 U.S.C. § 102(b). Pet. 15.

3. *Uhlik (Ex. 1004)*

Uhlik discloses a multi-antenna base station that receives a “request burst from a user terminal” and transmits “a message burst from the base station to the user terminal from which the request was received.” Ex. 1004, Abstract, Fig. 1. The message burst includes, among other things, “a description of the channels available on the radio communications system.” *Id.*

Uhlik describes the base station’s response as a “Configuration Message,” which follows a frame format with several fields specifying various configuration parameters for a receiver. *Id.* at 9:58–63, 15:4–18, Fig. 7. Figure 7 of Uhlik follows:

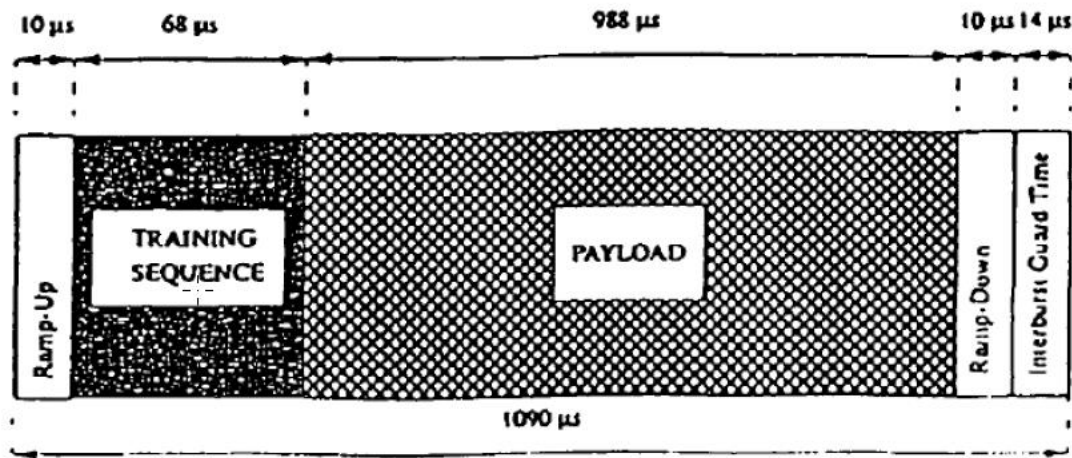


Figure 7 shows a Configuration Message. One field of the Configuration Message is a single-bit instruction to the terminal whether to use frequency hopping. *Id.* at 15:4–18.

Uhlik qualifies as prior art under 35 U.S.C. § 102(e). Pet. 19.

4. PHSv2 (Ex. 1007)

PHSv2 (Personal Handy Phone System Version 2) is a published industry standard that discloses a system for communication between personal stations (i.e., terminals) and cell stations (i.e., base stations). Ex. 1007, 17, 20. PHSv2 describes in detail the frame formats and functions of data 10 communicated between personal and cell stations. *Id.* at 56, 85. The frame formats include signals that instruct terminals how to communicate with base stations.

The '878 patent admits that PHS was background art. Ex. 1001, 1:36–44. Patent Owner does not dispute that PHSv2 was published prior to the earliest effective filing date for the '878 patent.

III. ANALYSIS OF THE CHALLENGED CLAIMS

The Petition challenges claims 1–4 of the '878 patent. Petitioner asserts grounds of unpatentability based on anticipation and obviousness.

A. Anticipation

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). To establish anticipation, “all of the elements and limitations of the claim must be shown in a single prior reference, arranged as in the claim.” *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001).

When evaluating a single prior art reference in the context of anticipation, the reference must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)). “[T]he dispositive question regarding anticipation[, therefore, i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference’s] teaching’ that every claim element was disclosed in that single reference.” *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (alterations in original) (quoting *In re Baxter Travenol Labs.*, 952 F.2d 388, 390 (Fed. Cir. 1991)).

B. Obviousness

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was

made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called “secondary considerations,” including commercial success, long-felt but unsolved needs, failure of others, and unexpected results. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966) (“the *Graham* factors”).

Neither the Petition nor the Patent Owner has presented evidence on the fourth *Graham* factor. We therefore do not consider that factor in this final decision.

C. Ishida Challenge

Petitioner contends claims 1–4 are anticipated by Ishida. Pet. 42. We first address claim 1.

1. Claim 1

Petitioner’s analysis of claim 1 in relation to Ishida appears at pages 44–53 of the Petition. Petitioner supports its analysis with testimony from Dr. Wicker. Wicker I Decl. ¶¶ 171–184.

Petitioner asserts that Ishida discloses each element of claim 1. Pet. 44–53; Wicker I Decl. ¶¶ 172–184. For example, according to Petitioner, the claim 1 preamble, calling for a “radio base station apparatus for transmitting a frame to a radio terminal apparatus,” is found in Ishida’s radio base station (Fig. 1), which is a PHS base station communicating with a PHS telephone. Pet. 44 (citing Ex. 1005, Fig. 1, ¶¶ 27, 36); Wicker I Decl. ¶ 172. Patent Owner does not challenge this assertion. To the extent the preamble

is limiting, we find that for the reasons given by Petitioner, Ishida discloses the preamble of claim 1.

Claim elements 1a and 1b call for, respectively, “a receiver for receiving a connection request from the radio terminal apparatus” and a “transmitter for transmitting the frame to the radio terminal apparatus which has sent the connection request.” *See supra*. Petitioner contends these claim elements are met by Ishida’s PHS base station. Pet. 45–51; Wicker I Decl. ¶¶ 173–182. According to the claim, the transmitted frame includes “(1) a signal indicating a reception operation adapted to a transmission operation of the radio base station apparatus and (2) data.” Petitioner contends the LCH assignment frame from a mobile station (terminal) in Ishida meets this limitation. *Id.* at 48; Wicker I Decl. ¶¶ 179–182. Petitioner asserts “the ’878 patent and Ishida disclose the same thing: a PHS base station that responds to an LCH allocation request from a terminal, with an LCH assignment frame in the standard PHS format . . . together with a bit indicating whether the terminal is permitted to perform diversity reception.” Pet. 51 (citations omitted); Wicker I Decl. ¶¶ 179–182. Patent Owner does not challenge these assertions. We find that, for the reasons given by Petitioner, Ishida discloses claim elements 1a and 1b.

The final limitation, claim 1c, is a lengthy “wherein” clause that calls for a signal “having first and second bit values which specify first and second reception operations, respectively, one of the first and second bit values instructing the radio terminal apparatus to accept the frame only in a prescribed manner determined by the one bit value and adapted to a corresponding transmission operation of the radio base station apparatus.” To meet this limitation, Petitioner relies on the D flag illustrated in Ishida’s

Figure 5, *supra*. Pet. 52 (“Ishida disclosed that the D flag has first and second bit values which specify first and second reception operations.”); Wicker I Decl. ¶¶ 183–184. According to Petitioner, when the D flag is 1, “it indicates a diversity reception stop instruction against the mobile station.” Pet. 52 (citing Ex. 1005 ¶ 68). Petitioner describes this D flag as “a signal indicating a reception operation adapted to a transmission operation of the base station.” *Id.* at 50 (citing Wicker I Decl. ¶ 180). As Dr. Wicker testifies: “When the value was 1, it indicated a ‘diversity reception stop instruction,’ which means the base station is directing a transmission at one antenna and the terminal should only receive using that one antenna.” Wicker I Decl. ¶ 183 (citing Ex. 1005 ¶¶ 13, 68).

Relying on its proposed claim constructions, discussed *supra*, Patent Owner responds that in Ishida, the “D flag” bit “when set to ‘1’ and transmitted by a base station, instructs a receiver to stop performing diversity reception, and when set to ‘0’ informs the receiver that ‘diversity reception is available.’” PO Resp. 20. According to Patent Owner, however, “[n]either bit value . . . specifies a *distinct reception operation* to the receiver.” *Id.* (emphasis added). Also according to Patent Owner, “Ishida teaches at least four different types of reception operations.” *Id.* at 21. Thus, “an instruction to *stop* diversity reception would leave the mobile station with at least two different alternatives.” *Id.*

Petitioner responds by challenging Patent Owner’s proposed claim constructions. Pet. Reply 2–9. Petitioner first challenges Patent Owner’s position that the claims require a “unique reception operation.” *Id.* at 3–6. According to Petitioner, “[a]n indication of an operation is all the claims require.” *Id.* at 3 (citing Wicker II Decl. ¶¶ 12–22). We agree. Neither the

claims themselves nor the '878 patent specification requires the bit signal to specify a “unique” reception operation. All the claims require that the bit signal “specify first and second reception operations.” We find that, for the reasons given by Petitioner, the broadest reasonable construction of this term does not require “a unique reception operation.” Pet. Reply 3–6; Wicker II Decl. ¶¶ 12–22.

We conclude and find that Ishida meets the limitations of claim element 1c. We agree with Petitioner that, “Ishida’s teachings parallel the disclosures in the '878 patent.” Pet. Reply 11. Referring to Figure 7 of Ishida, Ishida describes two reception operations that relate to the D flag: diversity reception and one-antenna reception. *Id.* at 10 (citing Wicker I Decl. ¶ 74; Wicker II Decl. ¶¶ 33–37). As Petitioner further explains: “In this [Figure 7] embodiment, the D flag specifies two operations: one-antenna reception (a value of 1) or diversity reception (a value of 0).” Pet. Reply 11 (citing Ex. 1005 ¶¶ 78–80; Wicker II Decl. ¶¶ 35–37).

We further agree with Petitioner that “[t]he ['878] patent also teaches sending a one-bit signal that, if set to one value, instructs a terminal to stop diversity reception and start one-antenna reception.” *Id.* (citing Ex. 1001, 15:36–60, 16:21–23, 16:35–64.). *See also* discussion of the '878 patent, *supra*. Thus, we find that in the '878 patent, as in Ishida, “the alternative to stopping diversity reception is to perform diversity reception.” *Id.* (citing Wicker II Decl. ¶ 38). We thus agree with Petitioner that “[s]etting the one-bit signal to its second value thus instructs the terminal to use diversity reception rather than stopping it.” *Id.* at 12 (citing Ex. 1001, 15:36–60, 16:21–23, 16:35–64; Wicker II Decl. ¶ 38).

Petitioner responds to Patent Owner’s argument that “Ishida teaches at least four different types of reception operations” (PO Resp. 21), explaining “although Ishida mentions adaptive array reception and ‘maximal-ratio combiner’ diversity reception, it does so merely as background; its disclosed terminals do not use either.” Pet. Reply 12 (citing Ex 1005 ¶¶ 8–9, 74; Wicker II Decl. ¶ 39). We agree with this analysis, and find that consistent with Dr. Wicker’s testimony, in Ishida, “when the D flag is set to 1, the terminal has only one option: single-antenna reception. A D flag set to 1 thus specifies a reception operation and instructs a terminal to receive a frame in a prescribed manner, that is, using a single antenna.” Wicker II Decl. ¶ 39.

We are thus persuaded by Petitioner’s showing and find that the disclosure in Ishida where a mobile station stops diversity reception in accordance with a diversity reception stop instruction received from the radio base station and starts performing a reception using one antenna meets this limitation. Pet. 47–52; Wicker I Decl. ¶¶ 176–184; Pet. Reply 9–14; Wicker II Decl. ¶¶ 33–40.

We have considered Patent Owner’s other rebuttal arguments and find them unconvincing. For example, according to Patent Owner, in this embodiment of Ishida, “the single-antenna reception in this example stems not from any specificity of the bit—there is none—but rather *from the receiver’s unique programming*, which falls outside the scope of the challenged claims.” PO Resp. 21 (emphasis added). For the reasons that follow, we are not persuaded by this argument.

We explored this issue with Patent Owner’s counsel during the oral hearing. Hearing Tr. 24:2–26:4. To summarize this discussion, a bit, by

itself, is a one or a zero that has to be interpreted by the receiving terminal to have any meaning:

THE BOARD: Well, let's look at that a little more carefully, Counsel. When you say specify, a bit is a one or a zero; it's code. Isn't it? Wouldn't you say that?

COUNSEL: Exactly. Yes, Your Honor.

THE BOARD: By itself, it has no meaning. It's either a high signal or a low signal, or however you want to represent that electronically, but it's basically a one or a zero.

COUNSEL: Correct.

THE BOARD: So it has no meaning unless it's decoded?

COUNSEL: Certainly, it has to be understood by the terminal to mean something.

Hearing Tr. 24:2–24:14. This discussion with counsel for Patent Owner echoes the testimony of Dr. Wicker: “[A] bit value is only a digital value of 0 or 1 and has no meaning by itself. It can only be interpreted in light of pre-existing choices implemented within processing software of the terminal that will receive the value.” Wicker II Decl. ¶ 30.

We therefore disagree with Patent Owner's argument that “*the claimed bit value*—and not a process performed by the receiver *independent* of the bit value—must determine how the receiver accepts the frame.” PO Resp. 17. As Dr. Wicker testifies: “Unless the terminal performs the required interpretation through processing, a bit value of 0 or 1 has no meaning. It is simply a logical value.” Wicker II Decl. ¶ 30.

Nor are we persuaded by Patent Owner's argument that the D flag in Ishida does not “specify a reception operation,” but merely “*informs* the receiver that diversity operation is possible.” PO Resp. 24. As Petitioner points out, “in one D flag embodiment a value of 0 instructs the terminal to

use diversity reception because diversity reception is the only alternative to one-antenna reception. In that embodiment, diversity reception is compulsory, not just possible.” Pet. Reply 13 (citing Wicker II Decl. ¶¶ 35–37). As Dr. Wicker testifies:

Patent Owner fails to acknowledge that an instruction not to perform one reception operation can also be an instruction to perform a different reception operation. For example, in a system that is capable of only two reception operations, an instruction to receive without using one operation necessarily indicates using the other reception operation.

Wicker II Decl. ¶ 24.

We have considered Patent Owner’s additional arguments and find them similarly unavailing. For example, we are not persuaded that Petitioner is attempting to “fill in the gaps” in Ishida with expert testimony, or that “Petitioner’s expert relied repeatedly on what Ishida allegedly ‘implied’ rather than what it explicitly or inherently disclosed.” PO Resp. 18–19. *See In re Preda*, 401 F.2d 825, 826 (CCPA 1968) (noting that “in considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom”). We find the testimony of Dr. Wicker relied on in this decision to be supported properly by the disclosures of Ishida and the ’878 patent. On the other hand, we find Dr. Sharony’s testimony on claim construction, which largely mirrors Patent Owner’s proposed constructions, discussed *supra*, to be less credible for the reasons discussed in connection with those contentions. *See, e.g.*, Sharony II Decl. ¶¶ 37–48.

Accordingly, for the foregoing reasons, we find that Ishida discloses a signal “having first and second bit values which specify first and second

reception operations, respectively, one of the first and second bit values instructing the radio terminal apparatus to accept the frame only in a prescribed manner determined by the one bit value and adapted to a corresponding transmission operation of the radio base station apparatus.” We therefore conclude that Ishida discloses all elements of claim 1, including their arrangement.

2. Claims 2–4

Petitioner’s analysis of independent claim 3 incorporates its analysis of claim 1. Pet. 54–55. Patent Owner does not separately argue claim 3, combining its arguments for claim 3 with its arguments for claim 1, which we have addressed *supra*. PO Resp. 26–27.

Dependent claims 2 and 4 call for a plurality of antennas. Petitioner relies on Ishida’s disclosure of Figure 1, showing a base radio station that receives a connection request by a plurality of antennas and transmits a frame by a plurality of antennas. Pet. 53–54. Patent Owner does not separately argue these claims. PO Resp. 6–7. We find that for the reasons given by Petitioner, Ishida discloses the limitations of claims 2–4.

3. Summary

In sum, based on the full record developed during trial, we find that for the reasons given above, Petitioner has demonstrated by a preponderance of the evidence that each limitation of claims 1–4 of the ’878 patent is disclosed by Ishida. We, therefore, determine that Petitioner has carried its burden of proving that claims 1–4 are anticipated by Ishida.

As noted above, Petitioner also contends that claims 1–4 are anticipated by or would have been obvious in light of Park alone, Uhlik

alone, and PHSv2 and Uhlik, combined. *Id.* at 29, 56, 66. Because we find that Petitioner has demonstrated claims 1–4 are anticipated by Ishida, is it unnecessary for us to reach the remaining grounds of unpatentability proposed by Petitioner. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming a ground based on anticipation); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (an administrative agency is at liberty to reach a decision based on a dispositive issue).

IV. CONCLUSION

Based on the arguments and evidence presented during trial, Petitioner has demonstrated by a preponderance of the evidence that claims 1–4 of the '878 patent are unpatentable under 35 U.S.C. §102.⁵

⁵ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

A summary of our conclusions is set forth in the table reproduced below.

Claims	35 U.S.C. §	Reference(s)	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–4	102	Ishida	1–4	
1–4	102, 103 ⁶	Park		
1–4	102, 103	Uhlik		
1–4	103	PHSv2, Uhlik		
Overall Outcome			1–4	

V. ORDER

Upon consideration of the record before us, it is:

ORDERED that claims 1–4 of the '878 patent are determined to be *unpatentable*;

FURTHER ORDERED that because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

⁶ As explained above, because we find that Petitioner has demonstrated claims 1–4 are anticipated by Ishida, is it unnecessary for us to reach the remaining grounds of unpatentability proposed by Petitioner. *In re Gleave*, 560 F.3d at 1338.

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Patent 7,369,878 B2

PETITIONER:

Tyler Bowen
Bowen-ptab@perkinscoie.com

Bryan Banks
Banks-ptab@perkinscoie.com

PATENT OWNER:

Timothy Devlin
Td-ptab@devlinlawfirm.com

Patrick Delaney
pdelaney@devlinfirm.com

Leonard Monfredo
lmonfredo@devlinfirm.com